CROUP.

BY

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PROFESSOR MATERIA MEDICA AND THERAPEUTICS, NATIONAL UNIVERSITY,

Washington, D. C.

[Reprinted from the AMERICAN JOURNAL OF OBSTETRICS AND DISEASES OF WOMEN AND CHILDREN, Vol. XXI., September, 1888.]

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CROUP.[1]

I HAVE selected the subject of *Croup* to bring before the Society this evening, not that I have any new facts to present, but having had a number of cases of the membranous variety, and they all having proved fatal, I bring the subject, hoping to provoke a discussion which will at least be beneficial to myself.

Croup was first described as a distinct disease by Dr. Blair, in 1718, but it was not until after the publication of Dr. Home, of Edinburgh, in 1765, that it came to be recognized as a special disease. Until that time, it was confounded with catarrh and other diseases of the respiratory apparatus. Dr. Home gave the disease the name of croup—an appellation by which it is universally designated at the present day. Since that time, many essays have been written on the pathology and treatment of this disease by distinguished gentlemen, both at home and abroad, but their views as to its nature, and the most certain and efficacious mode of treatment, are not uniform, and have not settled the question as to how the disease should be treated.

In 1811, Dr. David Hossak published a valuable essay on this disease, containing substantially the pathology of the affection, which has generally been adopted up to the present time. He maintains the inflammatory character of the disease, and says that in eighteen years' practice he has never met with a case uncomplicated with symptoms of local inflammation.

Croup may, therefore, be defined to be a disease of the laryngeal or laryngo-tracheal mucous membrane, in which inflammation or high vascular irritation is combined with spasm of

[1] Read before the Washington Obstetrical and Gynecological Society, May 4th, 1888.

the interior muscles of the larynx, giving rise to peculiar modifications of voice, cough, and respiration. It is essentially an inflammation of the air passage, with hoarseness of a peculiar character. It is said to always attack the larynx, and extends generally to the trachea, and not infrequently more or less deeply into the bronchial tubes. Associated with the inflammation, there is almost always spasm of the laryngeal muscles. This inflammation may and does sometimes exist in the trachea without the laryngismus, even when the cough may be hoarse and grating, and even when exudations resembling shreds of the scum of boiled milk are found in the fauces, especially of patients who have recently suffered from measles or scarlet fever, and who have complained only of the annoying tickling cough. On the other hand, spasm of these muscles may exist independent of inflammation, constituting a distinct disease, laryngismus stridulus, which appears to be a local affection of the nervous system, caused by the irritation of dentition, or some disordered condition of the alimentary canal.

This disease, croup, is confined almost exclusively to infancy and childhood, and occurs usually between the first and fifth year. From the first to the fifth year is the period when children are particularly liable to catarrhal affections, and these affections are rendered more dangerous by the very great excitability of the mucous tissue in early life, and the imperfect development of the larynx and trachea, and the small size of the glottis. Of 330 cases reported by Andral, 21 were under 1 year of age, 202 were between 1 and 5 years, 71 between 5 and 8 years, and only 36 were over 8 years old. In Massachusetts, in 1852, 429 cases of croup were reported; of this number, 357 were under 5 years of age, 71 between 5 and 10 years, and 1 was reported as being upwards of 20 years of age. The health officer for the District of Columbia, in his report for the fiscal year ending June 30th, 1887, reports 25 deaths from croup during the year, 21 occurring before the 5th year, and 4 between the 5th and 10th years. The youngest patient I have found recorded as having had membranous croup was only 3 weeks old; I will refer to this case again.

Croup in its mildest form occurs most frequently to those children who have full faces and slender limbs, and are of delicate constitutions and nervous temperaments. Such children usually have clear, pale complexions, may be fat, but are rarely,

if ever, over-muscular. In such children, it may be excited by slight catarrh, over-play, or some slight exposure.

The disease is quite frequently preceded, for two or three days, by catarrh, with cough, hoarseness, sneezing, and suffusion of the eyes. After the continuance of these symptoms, sometimes for several days, febrile symptoms make their appearance, the pulse becomes frequent and hard, the skin hot and dry, the face slightly flushed, eyes red and watery, and the tongue white and loaded at its base. In perhaps the large majority of cases, the disease is ushered in suddenly, usually at night, the child awaking out of a sound sleep, with the peculiar loud, barking cough which it is scarcely possible to describe, but which cannot fail to be recognized after having been once heard there is also great dyspnœa and harsh or whistling respiration. The voice is rough and hoarse, and the patient will sometimes complain of pain, pointing to the larynx, which is occasionally found to be swollen externally. Usually all the unpleasant symptoms abate in the course of from two to three hours, to return again the next night, but not so severely. Unfortunately, this is not always the case, neither does it always commence in this abrupt manner, but is of slower development, and drifts along for two or three days until the membranous form is developed.

Condie, in referring to these two varieties, says: "The patient, on retiring apparently in perfect health, is suddenly awakened from sleep with a violent fit of loud, ringing cough," etc.; and ten pages further on says: "True croup always commences gradually, the severer paroxysms never occurring until the disease has lasted for at least some short time," but he does not say how long this "some short time" must be.

Dr. Jacobi, of New York, uses the following language: "This much may be stated, and practitioners will admit the fact, that the affection will frequently commence in the milder form, and afterwards assume a more formidable character."

"The symptoms," says Wood, "are sometimes at first exactly those of catarrhal croup, and the difference is not detected until the voice begins to become whispering, and the cough to exchange its peculiar ringing sonorous character for a husky sound, and in the earliest stages, before secretion has commenced, it would be impossible to determine with certainty which form the disease was about to assume."

Dr. Peaslee says: "We need not, for any practical purpose,

admit an inflammatory and membranous variety of croup, for croup is always inflammatory, and some cases are accompanied by the formation of false membrane. The formation of a membrane should not affect the treatment of the disease as an inflammation, but merely because of its mechanical effects. Its occurrence cannot be predicted in any case until it is actually seen, and this is not possible in most cases, even when it is developed at the very outset of the disease."

Of two men equally well informed, one tells us that while membranous croup is almost always fatal, the spasmodic and simply inflammatory form will almost as surely recover even without treatment; the other will tell us that they are essentially the same thing, and that the mildest variety, unless properly treated, will go on to membranous formation and death.

Without attempting to settle any of the questions involved in these different opinions, I have come to the following conclusions:

That croup is a special or single disease.

That its distinctive and essential character consists in an inflammation of the secreting surface of the fauces, larynx and trachea, and that the exudative inflammation commences invariably in the superior portion of the respiratory passage, and extends from above downward.

In speaking of croup as a special or single disease, I do not mean to say that it never accompanies or follows other diseases. I saw a fatal case, following measles, only a few weeks ago.

That form of the affection which has been termed spasmodic or catarrhal croup by some writers, is a variety of this malady and not a distinct disease. When children of a nervous temperament are exposed to the ordinary exciting cause of croup, and become the subjects of this disease, we have the spasmodic variety, the inflammation being of a subacute character, commencing frequently at night; and by morning, and especially after an emetic has been given, there will be a gradual subsiding of all the unpleasant symptoms. Unfortunately, as I have said before, the disease is not always arrested at this point.

In one instance, occurring in my own practice, there were decided remissions, the voice and respiration becoming quite natural at times; this continued for three or four days and nights, the child being quite comfortable during the daytime, but growing worse again as night would come on. After the fourth

night, the fever did not abate as it had done previously, and there was now decided hoarseness. The child died on the sixth day, having had, for the last twenty-four hours, all the symptoms of a membrane having formed.

The occurrence of short intervals of natural breathing which take place every little while in spasmodic croup, is not because there is no inflammation present, but for the reason that the inflammation at this stage of the disease is not of sufficient extent to embarrass respiration when the spasm relaxes, but as in my case the symptoms may return, growing gradually worse, and as the disease advances there is a membranous formation which gradually increases and becomes denser.

The remissions are now less complete, and are of shorter duration, and the cough and difficulty of breathing more severe. The pulse and respiration gradually increase in frequency and lessen in force. Death may occur suddenly during a fit of coughing, or more slowly from suffocation or heart clot.

M. Guersent, and other pathologists have shown from dissections in cases where this spasmodic form of croup has terminated fatally, that albuminous concretions, sometimes extensive, but more frequently consisting of small isolated patches, are found in the larynx.

Dr. Williams, in a treatise on diseases of the respiratory organs, says, "Although the effusion is generally thickest and more tough in sthenic cases, yet it is pretty abundant in asthenic cases, so much so that Andral and Gendrain consider plastic inflammation of the mucous membrane to be rather of the subacute, than of the most acute kind."

There is another form of croup, diptheritic or secondary, which has caused considerable trouble to many medical writers. Some claim that membranous croup is purely a local disease, and secondary croup a constitutional affection, while others, such as Sir William Jenner, Dr. Geo. Johnson, Dr. Semple, and others claim as confidently that they are one and the same thing.

To me croup is a primary, local, non-contagious disease, the chief exciting cause being the impression upon the body, of a cold or damp atmosphere, or sudden transition of temperature, the disease being most prevalent during the variable and chilly weather which prevails in the commencement of spring or close of autumn, or during the thaws we have here in Washington

during the winter months. Several of my cases have occurred during the month of January, after comparatively warm weather. It may be produced at any season of the year when there is a sudden alteration of temperature. Sitting or lying on the damp grass, after becoming heated by exercise, or a sudden chilling of the body from any cause, may induce the disease, and as a rule children only are affected; while diphtheritic croup is a secondary, constitutional and infectious disease, attacking adults as well as children. The diphtheria itself, a local disease at first, is even in its local character eminently infectious, and is analogous to the septicemia of wounded men and puerperal women, and is dependent on some poison either generated within the body, or external to it, and is most insidious in its attack, being fully developed in many instances, and the patient still unconscious of any serious affection of the throat. In one instance, the little sister of a patient of mine died while sitting on the floor playing with her toys. Her parents had not even thought of her being sick; several members of the family were sick with diphtheria at the time.

Dr. Geo. W. Gay calls these affections primary croup, and diphtheritic croup, and says "these diseases often resemble each other in the following particulars: Both are of common occurrence in children; in both there is an exudation of false membrane; in both there is difficult respiration and impairment of the voice; in both a fatal result is common, and death is not infrequently caused by suffocation. The contrast between the symptoms of typical cases of the two varieties is indicated in the following groups:

PRIMARY CROUP.	DIPHTHERITIC CROUP.
A local disease.	A constitutional disease.
Begins in the larynx.	Begins in the fauces.
Not traceable to local cause.	Often traceable to bad drainage etc.
Neither contagious nor infectious.	Both contagious and infectious before and after death.
Membrane does not extend to nares.	Membrane often extends to nares and other parts.
No symptoms of septicemia.	Septicemia generally present.
No affection of lymphatics.	Lymphatics usually affected.
Neither attended nor followed by paralysis.	Paralysis not infrequent.

The nomenclature of Dr. Gay seems to me to be correct, as he includes under the head of primary croup the two varieties, simple and membranous, and gives the other form its only proper name, diphtheritic croup.

A favorable termination may be expected when the form of the disease is mild, the frequency of the pulse moderate, when there is early and free expectoration, and when the respiration is comparatively quiet. A copious perspiration sometimes marks the commencement of returning health. An increased frequency and irregularity of pulse, with difficult respiration, purple lips, pale and cold cheeks, with drowsiness, would cause an unfavorable prognosis to be made. It is thought, too, that the younger the child the more fatal the disease is likely to prove. Death, too, is most likely to result in sthenic cases, where the disease develops rapidly, and this character of croup is more apt to attack the strong, thick-necked children, while in asthenic cases, when the membrane forms more slowly, or where croup comes on in the latter stages of diphtheria, a more favorable termination can be expected.

A new idea has recently been brought to my notice, and that is, that in all cases where a membrane is formed, the inflammation which produced it is arrested, and that while it was necessary to treat the inflammation before the formation of the membrane, it is necessary now to treat only the result. Is it possible that the forming of a membrane is a conservative act of nature? If so, it is in many instances very unfortunate for the little sufferer, for he is choked to death by the very effort nature is making to throw off the disease.

In the treatment of croup, prompt and decided action in the early stage is of the utmost importance. It is better, I think, to be a little too active than not active enough, for I am satisfied that many cases have been aborted, and have been termed simple croup, which if allowed to drift along without proper treatment, would have ended in the membranous variety, and, perhaps, in many instances in death.

The medicines and plans recommended by the various writers for the treatment of this disease are about as numerous as the writers themselves. The following are a few of them: Bloodletting, one ounce for every year of the child's age, leeches, cups, blisters, antimony, ipecac, sulphate of copper, subsulphate of mercury, sanguinaria, bal. copaiba, apomorphia, co. syr.

squill, calomel, ether, bromide of potassium, chloral, chloroform, iodide of pot., nitrate of silver, muriated tr. iron, chlorate of pot., ice to neck and spine, quinine, lactic acid, pepsin, lime water, tracheotomy, and intubation.

These have now resolved themselves into what might be termed the operative and medicinal. The majority of the profession, I am inclined to think, yield to the operative, but it is time for more extensive and careful observations upon the results of the medicinal plan to be made.

Agnew says, "I am of the opinion that with American practitioners the recoveries without an operation are at least fifty per cent."

Meigs and Pepper report 15 recoveries out of 35 cases, mostly of the secondary variety, without operation.

J. C. Smith reports 7 recoveries out of 21 cases, of membranous croup, without operation.

Koff reports 77 recoveries out of 99 cases of membranous croup, without operation.

J. C. Brown, of Kentucky, reports 2 recoveries out of 3 cases of membranous croup, without operation.

This list might be largely increased if it were necessary. Meigs, and almost all the old writers, strongly advise the use of emetics. Alum, in 5 to 10 gr. to a teaspoonful, at a dose, is one of the favorites. One advantage claimed for it is that it can be given several times a day without producing exhaustion.

Rillet and Barthez strongly advise the emetic treatment. They report that out of 31 cases of the membranous variety, 26 discharged false membrane and 15 were cured.

Koff, who reported 77 recoveries out of 99 cases of the membranous variety, used sulphate of copper, and claimed that it acted not only as an emetic but as an alterative.

Dr. J. C. Brown, of Kentucky, who reported 2 recoveries out of 3 cases, used pepsin in the two who recovered, but not in the one that died. After using in one case alum and ipecac, followed by iron and quinine in full doses, locally nitrate of silver and lime-water by the atomizer, and one-grain doses of calomel every six hours, he says, "The symptoms growing worse, I determined to try the solvent power of pepsin, and so gave my little patient 4 grs. of Shaffer's pepsin, in powder, with 2 grs. quinine every two hours, bathed him in hot water, and applied sinapisms to his extremities. In ten hours everything had changed for the better; at almost every act of cough-

ing large flakes of lymph were expectorated. In forty-eight hours the child's condition was so much improved that the cure was soon completed by tonics alone."

Prof. Fordyce Barker claims that there are but few cases which will not yield to turpeth mineral.

Topical medication was used to a considerable extent twenty-five or thirty years ago. To Dr. Horace Green belongs the credit of having introduced this method. He treated croup locally with nitrate of silver in sol. sixty grains to the ounce of rose water, and with a sponge probang would apply the solution not only to the fauces and opening of the larynx, but into the larynx and trachea, and in many instances into the right or left bronchus with as much ease and safety as the catheter is introduced into the bladder. He also established the fact that much less mechanical irritation is produced by the application of this strong solution into the larynx of young children suffering with croup than when it is introduced into those of adults who are suffering from chronic diseases of the larynx. The strength 60 grs. to ℥ i. was found to be less irritating to the mucous membrane and to exert a more beneficial effect than a weaker one. He claimed that one application, if made early in the disease, would arrest the inflammation, and was usually enough to effect a cure.

Apomorphia is coming quite largely into use for this disease. Its prompt and efficient action, unattended as it is with nausea and violent retching, should make it a great boon to the physician as well as the patient, and its use hypodermatically will many times save a long and exhausting struggle with the little patient.

The alkalies generally are solvents of false membrane, and lime-water, being one of the most pleasant and manageable for internal use, is perhaps oftenest resorted to. Smith speaks highly of lime-water containing one and one-half per cent of liquor potassæ, which is to be used through a Stearn atomizer.

I have had six cases of membranous croup and one case of diphtheritic croup to result fatally, and two cases of the diphtheritic variety to recover. In all nine cases, eight males and one female, seven white and two black.

In one case three and a half years old there was an accompanying pneumonia.

In another case occurring about six weeks ago, the child, a boy three years old, had just gotten over measles. On calling at another patient's house one Sunday in March, I found this little fellow at least a mile from his home. He was not taken home till late in the evening. That night he had croup, but as he had had the simpler form a number of times, perhaps twenty times during his short life, his parents were not alarmed, but gave him the medicine, an emetic, which I had ordered on a previous occasion. The next day the child seemed almost as well as ever, but was worse again Monday night. I was telephoned for early Tuesday morning, and saw the child a little after ten o'clock, found him almost well again. He was quite uncomfortable Tuesday night, better again all day Wednesday, but very decidedly worse Wednesday night. I was called again Thursday morning, and on examining the throat found a little film over the left tonsil; by night he was quite ill, and the cough, of which there had been but little up to this time, became hoarse, and had a peculiar jarring sound. On Friday morning the film had entirely disappeared from his throat, but he was now coughing up shreds of false membrane every little while. He died Friday night, five days after the exposure.

About three years ago, I was called to South Washington, to see a boy two and a half years old, who had been sick with diphtheria for about ten days, and in whom croup had just developed. The physician who had been in charge had either been discharged, or had abandoned the case; the parents were German, and I could not understand just what they were saying about it. On examination I found a membrane covering the whole throat, and which seemed to extend not only into the nostrils, but down the esophagus and larynx. In this case I did not think any treatment could avail and did not advise tracheotomy, feeling that it would be useless. The child died the same evening, about an hour after my visit.

One of the cases I have referred to as recovering, was not properly my patient. I saw him in consultation, but not remembering the particulars, I asked the child's father to supply them, which he has done in a note of which the following is an extract: "On August 6th, 1880, while living near Falls Church, Va., our son Claud, six years of age, was taken sick with what the doctor called diphtheria. He gradually grew worse until the afternoon of August 15th, nine days after he was first taken sick, when croup set in. By night his breathing could be heard out in the yard. At two o'clock that night a messenger was sent to the city for you, to meet our doctor the next morning at ten o'clock. You came out and remained with us several hours. We lighted a fire in the child's room, and raised the temperature to nearly 90°, began slaking lime in the room, kept lime-water boiling on the stove, and occasionally had him inhale the steam from the boiling lime-water. We kept up this treatment for several days after your visit, and he gradually recovered."

On last Christmas morning, I was called to see the child of one of my neighbors, a little girl five years old, who three days before stood at an open window watching some member of the family who was at work in the back yard. For the next day or two it was noticed that she was not as sprightly as usual, and that she had some cough, not severe, but gradually growing hoarser. On Christmas morning I was called, and found her lying on a lounge, dressed, and playing with her doll babies which had been given her that morning. She was quite bright and talkative, but could speak only in a whisper, and with considerable effort, but apparently without pain. The features were darkened and swollen, respiration 30, pulse 120. I advised that tracheotomy be performed at once, but the family would not hear of it. I then asked for a consultation, but this too they thought unnecessary. I called several times during the day, to find the child gradually growing worse. About seven o'clock that evening I insisted on some physician being called in consultation, which was finally done at 7.30 P.M., and the family seemed much surprised that the consultant took as gloomy a view of the case as I had done. At eleven o'clock that night they agreed to allow an operation. I telephoned at once for Dr. Barker who had been with me only a few hours before, and to Dr. J. Ford Thompson, who had been notified earlier in the day that his services would likely be required. By twelve o'clock the operation, intubation, had been performed, and for about two hours the breathing, which had become very much embarrassed, was considerably relieved, but by morning was worse than ever. About ten A.M., the tube was removed, and by eleven o'clock, twenty-four hours after I was first called, the child was dead.

It would hardly be profitable to give a detailed statement of my treatment of these cases, as I have been unsuccessful in every instance of purely membranous croup. I have, however, had several of the diphtheritic variety to recover. In treating these cases I have endeavored as far as possible to preserve the strength of the patient, and have used two of the medicines, (muriated tincture of iron and chlorate of potassium) which were so severely condemned a few weeks ago by members of this Society, when the subject of diphtheria was under discussion. I have used emetics, mercury, opium, constant external applications of warmth and moisture to the neck, steam atomizer as faithfully as possible—using tr. iodine in sol., carbolized water, lime-water, sol. chlorate of potassium, have kept lime slaking in the room, or boiling on the stove, and have kept the room at a high temperature and loaded with steam.

The inhalation of steam from lime-water seemed to afford relief in all my cases and after an emetic, in several instances,

the voice would clear up, and the breathing become quite easy for an hour or two.

And now quite an important question might be asked, Can we do any good by operative interference? This is a question that forces itself upon every one of us. Looking at the pathology of the disease, remembering that the inflammation frequently extends into the bronchial tubes, that serious dyspnea is caused by the exudation occurring in the trachea and bronchi, and that both tracheotomy and intubation have a tendency to produce bronchitis and pneumonia; still, there are times when operative interference seems absolutely necessary. Now what shall the operation be, tracheotomy or intubation?

The statistics of results from the operative treatment of croup are very extensive, and those of late years here in America are pretty uniform in character. Agnew has collected over eleven thousand cases, showing recovery in one-fourth of those operated on. Tracheotomy is not a very dangerous or difficult operation in itself, and the mortality following its practice is due in many instances to a weakened state of the system, as the operation is frequently not resorted to until the very last moment, when the patient is beyond the power of recuperation. We are advised by many to operate early, but I hardly think this is good advice, for we cannot early know that there is any necessity for operative interference, and then, too, death may occur from the operation by hemorrhage, by irritation, by bronchitis, by pneumonia, and by accidents caused by the struggling of the patient.

Intubation is comparatively a new operation; its most earnest advocates hardly claim that the operation has been fully developed, or the instrument perfected. Dr. O'Dwyer, in the *N. Y. Medical Record* for October, 1887, reports fifty cases of croup in private practice, treated by intubation of the larynx with twelve recoveries. The danger of tubes slipping into the trachea has, I think, been very much underestimated by the profession. It is probable that when this accident occurs, we ordinarily hear nothing about it. Not long since I heard of a case where, after the death of the child, the tube was found in the bronchus. Dr. Ingalls, of Chicago, had an unfortunate case this past winter in a child he was treating; he used an ordinary O'Dwyer tube with a good-sized head; the child did well and seemed to have recovered, when on the fifth day he

attempted to extract the tube, he says: "As I had the tube nearly out the extractor slipped; I tried repeatedly, and the extractor slipped again and again, until finally the tube slipped into the trachea, and I had to do tracheotomy to remove it. The child died about two hours later."

Can we assume that the one out of four or five who has lived after being operated on, by either of these methods, was always saved by the operation?

While I must, and do admit the necessity at times of operative interference, I certainly do not think intubation can compare with tracheotomy. In my opinion we gain but little by passing a tube into the larynx, but the benefit derived from tracheotomy is twofold. It enables us to remove the false membrane through the opening, and to apply topical remedies, nitrate of silver for example, through the opening directly to the trachea and bronchial tubes.

The case referred to, as being the youngest patient I could find any record of, as having had membranous croup, and on which tracheotomy had been performed, was reported by Dr. Scoulette as occurring in his own family, to his own child only three weeks old. The operation was performed on the third day of the disease, under, the doctor says, "circumstances the most desperate with complete success, the infant recovering in a short time from the effects of the operation, as well as from every symptom of the croup."